

Understanding User Satisfaction in Online Banking: The Role of Technology Perceptions

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ABSTRACT

The rapid advancement of digital technologies has transformed the banking industry, positioning online banking as a primary channel for financial service delivery. Despite its widespread adoption in Malaysia, concerns regarding usability, functionality, and security continue to shape users' banking experiences. This study examines the level of user satisfaction among online banking users in Penang and investigates the influence of perceived ease of use, perceived usefulness, and perceived security on user satisfaction. Grounded in the Technology Acceptance Model (TAM), a quantitative research design was employed using a structured questionnaire administered to customers of Maybank, CIMB Bank, and Public Bank in Penang. A total of 355 valid responses were collected through purposive sampling and analysed using IBM SPSS Statistics Version 28. Descriptive statistics and multiple regression analysis were employed to address the research objectives. The findings indicate a high level of user satisfaction with online banking services. Perceived ease of use and perceived security significantly influenced user satisfaction, while perceived usefulness had no significant effect. Perceived ease of use emerged as the strongest predictor. The study extends TAM within the Malaysian online banking context and highlights the importance of providing simple, secure, and user-friendly digital banking experiences.

Keyword: online banking; perceived ease of use; perceived usefulness; perceived security; user satisfaction

INTRODUCTION

The rapid evolution of digital technologies has fundamentally transformed the global financial services industry. The integration of information technology into banking operations has reshaped how financial institutions interact with customers, enabling greater efficiency, accessibility, and service convenience. In particular, the widespread adoption of electronic commerce (e-commerce) has accelerated the demand for digital payment systems and online banking services, encouraging financial institutions to redesign their service delivery models to accommodate changing consumer behavior. The previous pandemic further intensified this digital transformation, compelling businesses and consumers to rely heavily on technology-driven platforms to perform daily transactions (Ilieva et al., 2022; Tonby et al., 2021). These developments have positioned online banking as one of the most important channels for delivering banking services in the digital era.

Malaysia has experienced remarkable growth in internet penetration and digital adoption over the past decade. According to Statista (2023), the number of internet users increased from approximately 18.9 million in 2013 to more than 33 million in 2023, representing a penetration rate of approximately 96.8% (Kemp, 2023). This rapid expansion of internet accessibility has significantly influenced consumer purchasing behavior, encouraging greater utilization of electronic payment systems and online banking services. The Malaysian banking industry has consequently intensified its digital transformation initiatives by investing in advanced banking platforms, mobile applications, and electronic payment infrastructures to satisfy growing customer demand for faster, safer, and more convenient financial services (Bank Negara Malaysia [BNM], 2022a; CIMB, 2022).

Online banking has become one of the most widely used retail payment channels because it enables customers to perform financial transactions conveniently regardless of geographical location or time constraints. Modern online banking platforms provide customers with a comprehensive range of services, including fund transfers, bill payments, online shopping, investment management, and account monitoring through websites and mobile applications (Rahi & Abd. Ghani, 2019c; Abdul Sathar et al., 2022). The increasing adoption of online banking

has also contributed to Malaysia's national agenda of promoting a cashless society while improving the efficiency of the country's payment ecosystem. According to Bank Negara Malaysia (2022c), the value of online banking transactions has increased substantially over recent years, reflecting growing consumer confidence in digital financial services. Similarly, Public Bank Berhad reported continuous growth in active online banking subscribers despite changes in customer preferences towards mobile banking platforms (PBB, 2022).

The increasing popularity of online banking has intensified competition among financial institutions. Rather than competing solely through financial products and pricing strategies, banks increasingly differentiate themselves through customer experience, digital service quality, and technological innovation. Customers now expect banking applications to provide intuitive interfaces, reliable functionality, personalized services, and secure transaction environments. Advances in digital technology have therefore elevated customers' expectations regarding service quality and convenience, requiring financial institutions to continuously innovate to remain competitive (Alnaser et al., 2023; Rahi et al., 2023). Customer satisfaction has consequently emerged as a strategic performance indicator that reflects the success of digital banking initiatives and influences customer retention, loyalty, and long-term organizational performance.

Despite the substantial growth of online banking adoption, ensuring high levels of user satisfaction remains a significant challenge for financial institutions. Annual reports published by major Malaysian banks indicate a gradual decline in customer satisfaction despite continuous investments in digital banking technologies. For example, CIMB's customer satisfaction indicator declined from 87% in 2020 to 82% in 2022, suggesting that technological advancement alone may not necessarily translate into improved customer experiences. Similarly, unresolved customer complaints increased considerably during the same period, highlighting persistent service issues that require further attention (CIMB, 2022; MBB, 2022). These trends suggest that banks must understand the underlying factors that shape user satisfaction rather than relying solely on technological innovation.

Previous research has consistently demonstrated that customer satisfaction plays a crucial role in strengthening customer relationships, encouraging continued system usage, and generating positive word-of-mouth recommendations (Garepasha et al., 2020). Satisfied users are more likely to maintain long-term relationships with financial institutions, whereas dissatisfied users may switch to competing service providers or reduce their use of digital banking services (Raza et al., 2020). Consequently, understanding the determinants of user satisfaction has become increasingly important within relationship marketing and digital banking literature. However, existing studies have primarily concentrated on technology adoption, behavioral intention, electronic service quality, and trust, with comparatively less emphasis on how users' perceptions of information technology directly influence overall satisfaction in the Malaysian online banking context.

Information technology perceptions represent users' evaluations of technological characteristics that influence their interactions with digital systems. Guided by the Technology Acceptance Model (TAM) proposed by Davis (1989), two of the most frequently examined constructs are perceived ease of use and perceived usefulness. Perceived ease of use refers to the extent to which users believe that using a system requires minimal effort, whereas perceived usefulness reflects users' beliefs that technology enhances task performance. Within the context of online banking, security has also become an increasingly important technological attribute due to rising concerns over cybercrime, online fraud, phishing attacks, and data privacy breaches (Zhang et al., 2022; Md. Abul Hayat & Md. Fokhray Hossain, 2023). Customers are unlikely to express satisfaction if they perceive digital banking platforms to be vulnerable to security risks, regardless of their functional capabilities.

Although numerous studies have investigated online banking from various perspectives, including artificial intelligence, Islamic banking, behavioral intention, phishing attacks, and digital adoption, relatively few have simultaneously examined the influence of perceived ease of use, perceived usefulness, and perceived security on user satisfaction within Malaysian local banking institutions. Furthermore, previous scholars have recommended extending existing theoretical models by incorporating additional technological factors to improve understanding of customer behavior in digital banking environments (Alarifi & Husain, 2021; Rahi et al., 2022). These recommendations indicate that further empirical investigation is required to determine whether users' perceptions of information technology continue to influence satisfaction in an increasingly mature online banking environment.

Accordingly, this study aims to address these gaps by examining the level of user satisfaction among online banking users in Penang and investigating the influence of three information technology perception constructs—perceived ease of use, perceived usefulness, and perceived security—on user satisfaction. Specifically, the study pursues two research objectives: (1) to identify the extent of user satisfaction among Penang bank users, and (2) to examine the relationship between information technology perceptions and user satisfaction. By focusing on customers of Maybank, CIMB Bank, and Public Bank, this study contributes empirical evidence that extends the application of the Technology Acceptance Model within the Malaysian banking context while offering practical recommendations for financial institutions seeking to enhance digital service quality and customer satisfaction.

Theoretical Background and Hypotheses Development

Digital technologies have transformed banking services from traditional branch-based operations to technology-enabled platforms that provide greater convenience, flexibility, and accessibility. Online banking enables customers to conduct transactions such as fund transfers, bill payments, account enquiries, and investment management regardless of time and location. As financial institutions continue to invest in digital transformation, understanding the technological factors that shape user satisfaction has become increasingly important. In online banking, user satisfaction reflects customers' overall evaluation of whether digital banking services meet their expectations. Satisfied customers are more likely to continue using online banking services, maintain relationships with their financial institutions, and recommend the services to others. Identifying the technological factors that influence satisfaction is therefore important for both banking institutions and digital banking research.

This study is grounded in the Technology Acceptance Model (TAM) proposed by Davis (1989), which identifies perceived ease of use and perceived usefulness as key determinants of users' acceptance of technology. In the online banking context, these technological perceptions may also influence customers' evaluations of their overall service experience. Given the importance of cybersecurity in financial transactions, this study extends TAM by incorporating **perceived security** as an additional technological factor. Accordingly, perceived ease of use, perceived usefulness, and perceived security are examined in relation to user satisfaction.

Perceived Ease of Use and User Satisfaction

Perceived ease of use refers to the extent to which individuals believe that using a particular technology requires minimal effort (Davis, 1989). In online banking, it reflects the extent to which customers perceive banking platforms as easy to understand, navigate, and use when performing financial transactions. As customers increasingly conduct banking activities independently through digital platforms, interface simplicity, intuitive navigation, and efficient transaction processes are important elements of the overall user experience. Previous studies generally support a positive relationship between perceived ease of use and customer satisfaction. User-friendly systems can reduce cognitive effort and transaction difficulties while increasing users' confidence in performing online banking activities. Rahi and Abd. Ghani (2019c) found that ease of use significantly enhanced customer satisfaction and continued usage intention. Similarly, Hosseini et al. (2022) reported that intuitive interfaces and simplified banking procedures improved users' banking experiences, while Alnaser et al. (2023) highlighted the continued importance of seamless digital interactions.

As banks introduce increasingly sophisticated digital features, maintaining simplicity while expanding functionality remains important. Based on TAM and the supporting empirical evidence, the following hypothesis is proposed:

H1: Perceived ease of use has a positive and significant relationship with user satisfaction.

Perceived Usefulness and User Satisfaction

Perceived usefulness refers to the degree to which individuals believe that using a technology enhances their performance or enables them to accomplish tasks more efficiently (Davis, 1989). In online banking, it reflects the perceived benefits of digital services in facilitating faster transactions, improving accessibility, reducing waiting time, and simplifying financial management.

Previous research has generally associated perceived usefulness with favorable evaluations of online banking services. Rahi et al. (2017), for example, found that perceived usefulness significantly influenced customers' evaluations of online banking. When customers perceive digital banking as beneficial and efficient, they are more likely to appreciate the value and convenience provided by the service. However, the role of perceived usefulness may vary as online banking becomes increasingly established. Core functions such as fund transfers, bill payments, and account monitoring are now standard features of digital banking rather than distinctive benefits. Consequently, customers may regard usefulness as a basic expectation rather than a factor that necessarily enhances satisfaction. Given these varying findings and the theoretical importance of perceived usefulness within TAM, the following hypothesis is proposed:

H2: Perceived usefulness has a positive and significant relationship with user satisfaction.

Perceived Security and User Satisfaction

Perceived security refers to customers' beliefs that online banking systems adequately protect their financial information, transaction data, and personal privacy from unauthorized access, cyberattacks, fraud, and identity theft (Zhang et al., 2022). Security is particularly important in online banking because financial transactions involve sensitive personal information and monetary assets.

The increasing prevalence of cybercrime and online financial fraud has heightened customers' awareness of digital security risks. Consequently, customers' confidence in the security of banking platforms can influence their overall service evaluations. Md. Abul Hayat and Md. Fokhray Hossain (2023) reported that effective security mechanisms enhance customers' confidence in online banking, while Rejman Petrović et al. (2022) found that security positively influences customers' evaluations of digital financial services. Despite banks' continued investment in cybersecurity, customers may remain concerned about online fraud. Effective security therefore involves not only implementing technical safeguards but also ensuring that customers recognize and have confidence in these measures. Based on previous empirical evidence, the following hypothesis is proposed:

H3: Perceived security has a positive and significant relationship with user satisfaction.

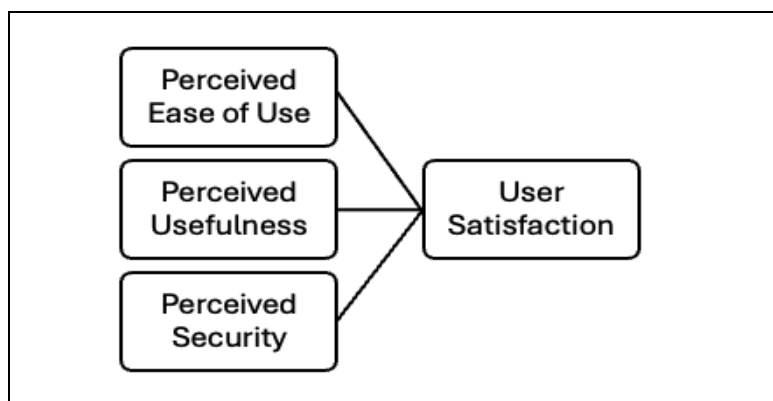


Figure 1 Conceptual Framework

Figure 1 illustrates the proposed research framework. Drawing upon the Technology Acceptance Model (Davis, 1989), the framework proposes that perceived ease of use, perceived usefulness, and perceived security directly influence user satisfaction. The model was developed to examine the extent to which customers' evaluations of these technological characteristics shape their overall satisfaction with online banking services in Malaysia.

METHODOLOGY

This study adopted a quantitative cross-sectional research design to examine the relationship between information technology perceptions and user satisfaction among online banking users in Penang, Malaysia. The quantitative approach was considered appropriate because it enables the objective measurement of relationships among variables through statistical analysis. Guided by the Technology Acceptance Model (TAM), user satisfaction was specified as the dependent variable, while perceived ease of use, perceived usefulness, and perceived security were examined as the independent variables.

The target population comprised customers of Maybank, CIMB Bank, and Public Bank who maintained active online banking accounts in Penang. These banks were selected because they are among the largest financial institutions in Malaysia and have well-established digital banking platforms. A purposive sampling technique was employed to ensure that respondents had prior experience using online banking services and were therefore able to provide meaningful evaluations of their banking experiences. Based on the G*Power sample size calculation, a minimum of 119 respondents was required; however, the study successfully obtained 355 valid responses, exceeding the recommended minimum and providing adequate statistical power for the analysis. Data were collected through a structured online questionnaire distributed via Google Forms over a one-month period.

The questionnaire consisted of two sections. The first section collected respondents' demographic information, while the second measured user satisfaction, perceived ease of use, perceived usefulness, and perceived security using measurement items adapted from established studies. All items were measured using a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). Prior to the main survey, a pilot study involving 36 respondents was conducted to assess the clarity and reliability of the instrument. Reliability analysis indicated satisfactory internal consistency, and the instrument was subsequently administered to the full sample. In addition, data screening procedures, including assessments of missing data, normality, outliers, and multicollinearity, confirmed that the dataset met the assumptions required for subsequent statistical analyses.

Data were analyzed using IBM SPSS Statistics Version 28. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and determine the overall level of user satisfaction. Pearson correlation analysis was conducted to examine the relationships among the study variables, followed by multiple linear regression analysis to evaluate the influence of perceived ease of use, perceived usefulness, and perceived security on user satisfaction and to test the proposed hypotheses. Ethical considerations were observed throughout the study by ensuring voluntary participation, maintaining respondents' anonymity and confidentiality, and using the collected data solely for academic purposes.

RESULTS

Data were obtained from 355 valid respondents who were active users of online banking services provided by Maybank, CIMB Bank, and Public Bank in Penang. Prior to hypothesis testing, the data were screened to ensure that the assumptions underlying multiple regression analysis were satisfied. The screening process confirmed that the dataset was suitable for inferential statistical analysis. Descriptive statistics were first employed to address the first research objective, followed by Pearson correlation and multiple linear regression analyses to examine the proposed relationships between information technology perceptions and user satisfaction.

Table 1 presents the descriptive statistics of the study variables. Overall, respondents reported relatively high perceptions across all constructs, with mean scores exceeding 4.00 on a five-point Likert scale. Among the independent variables, perceived ease of use recorded the highest mean ($M = 4.148$, $SD = 0.374$), followed by perceived usefulness ($M = 4.110$, $SD = 0.371$) and perceived security ($M = 4.029$, $SD = 0.450$). The dependent variable, user satisfaction, also demonstrated a high level of agreement ($M = 4.139$, $SD = 0.418$), indicating that respondents were generally satisfied with the online banking services provided by the selected banks. These findings address the first research objective by demonstrating that online banking users in Penang reported a high level of overall satisfaction.

Table 1. Descriptive Statistics

Variable	Mean	SD
User Satisfaction	4.139	0.418
Perceived Ease of Use	4.148	0.374
Perceived Usefulness	4.11	0.371
Perceived Security	4.029	0.45

Pearson correlation analysis revealed positive and statistically significant relationships among all study variables ($p < .01$). Perceived ease of use exhibited the strongest correlation with user satisfaction ($r = .805$), followed by perceived security ($r = .729$) and perceived usefulness ($r = .720$). These findings indicate that respondents who perceived online banking systems as easier to use, more useful, and more secure also tended to report higher levels of satisfaction. Furthermore, the correlation coefficients were below the commonly accepted threshold for severe multicollinearity, suggesting that the variables were sufficiently distinct for subsequent regression analysis.

Table 2. Correlation Matrix

Variable	1	2	3	4
1. User Satisfaction	—			
2. Perceived Ease of Use	.805**	—		
3. Perceived Usefulness	.720**	.814**	—	
4. Perceived Security	.729**	.734**	.739**	—

Note. $p < .01$.

Multiple linear regression analysis was conducted to examine the influence of perceived ease of use, perceived usefulness, and perceived security on user satisfaction. The overall regression model was statistically significant, $F(3, 351) = 261.413$, $p < .001$, explaining 69.1% of the variance in user satisfaction ($R^2 = .691$; Adjusted $R^2 = .688$). The Durbin–Watson statistic of 1.971 indicated that the residuals were independent, suggesting that the regression assumptions were satisfactorily met. Overall, the model demonstrated substantial explanatory power, indicating that information technology perceptions accounted for a considerable proportion of variation in users' satisfaction with online banking services.

Table 3. Multiple Regression Model Summary

Statistic	Value
R	0.831
R^2	0.691

Adjusted R ²	0.688
F	261.413
df	(3, 351)
p-value	< .001
Durbin–Watson	1.971

The regression results further revealed that perceived ease of use had a positive and significant influence on user satisfaction ($\beta = .540$, $p < .001$), supporting H1. Similarly, perceived security was found to have a positive and significant relationship with user satisfaction ($\beta = .276$, $p < .001$), providing support for H3. In contrast, perceived usefulness did not significantly influence user satisfaction ($\beta = .076$, $p = .164$); therefore, H2 was not supported. Among the three predictors, perceived ease of use emerged as the strongest determinant of user satisfaction, indicating that respondents placed greater importance on the simplicity and usability of online banking platforms than on their perceived usefulness alone.

Table 4. Hypothesis Testing

Hypothesis	Relationship	β	p-value	Decision
H ₁	Perceived Ease of Use → User Satisfaction	0.54	< .001	Supported
H ₂	Perceived Usefulness → User Satisfaction	0.076	0.164	Not Supported
H ₃	Perceived Security → User Satisfaction	0.276	< .001	Supported

Overall, the findings indicate that users' perceptions of ease of use and security play significant roles in shaping satisfaction with online banking services, whereas perceived usefulness does not exert a statistically significant effect. These results suggest that while customers value the practical benefits of online banking, their satisfaction is influenced more strongly by systems that are intuitive, easy to navigate, and capable of providing a secure banking environment.

DISCUSSION

This study investigated the influence of information technology perceptions on user satisfaction among online banking users in Penang, Malaysia. Specifically, it examined the effects of perceived ease of use, perceived usefulness, and perceived security on user satisfaction based on the Technology Acceptance Model (TAM). The findings provide valuable insights into the factors that contribute to customer satisfaction in an increasingly digital banking environment.

The first research objective sought to determine the level of user satisfaction with online banking services. The descriptive analysis revealed that respondents generally reported a high level of satisfaction, with a mean score of 4.139. This finding suggests that customers are generally satisfied with the online banking services offered by the selected Malaysian banks. The result is consistent with previous studies, which reported that continuous investments in digital banking infrastructure, improved mobile applications, and enhanced service accessibility have significantly improved customers' overall banking experiences (Raza et al., 2020; Khan et al., 2023). The finding also reflects the increasing maturity of Malaysia's digital banking ecosystem, where customers have become accustomed to conducting routine financial transactions through online platforms. Nevertheless, despite the high overall satisfaction level, customer expectations continue to evolve alongside technological advancement, requiring banks to continuously improve the quality of their digital services to remain competitive.

The regression analysis demonstrated that perceived ease of use was the strongest predictor of user satisfaction, supporting the first hypothesis. This finding reinforces one of the central propositions of the Technology Acceptance Model, which argues that technologies requiring less effort are more likely to generate favourable user evaluations (Davis, 1989). The result is consistent with previous studies conducted

by Rahi and Abd. Ghani (2019c), Hosseini et al. (2022), and Alnaser et al. (2023), all of which reported that simple navigation, intuitive interface design, and user-friendly banking applications significantly enhance customer satisfaction. As online banking has become an essential rather than optional service, customers increasingly expect digital platforms to operate efficiently with minimal complexity. Complicated authentication procedures, confusing menu structures, or lengthy transaction processes may negatively affect users' overall banking experience, even when the services offered are comprehensive. Therefore, the findings suggest that usability remains a critical competitive advantage for financial institutions seeking to strengthen customer satisfaction.

The results further indicate that perceived security has a significant positive influence on user satisfaction, providing support for the third hypothesis. This finding highlights the importance of security as a fundamental component of customers' online banking experiences. Given the increasing prevalence of cyber fraud, phishing attacks, identity theft, and financial scams, customers are becoming more aware of the risks associated with digital financial transactions. Consequently, users are more likely to express satisfaction when they believe that banking platforms effectively protect their personal information and financial assets. This finding supports previous studies by Zhang et al. (2022), Md. Abul Hayat and Md. Fokhray Hossain (2023), and Rejman Petrović et al. (2022), which concluded that robust security mechanisms strengthen customers' confidence and improve their overall evaluation of online banking services. The result also suggests that security should not be viewed merely as a technical requirement but rather as an important element of customer value creation and relationship management.

Interestingly, perceived usefulness did not demonstrate a statistically significant relationship with user satisfaction, leading to the rejection of the second hypothesis. This finding differs from the original assumptions of the Technology Acceptance Model and from several earlier studies that reported usefulness as a significant predictor of technology acceptance and satisfaction. A plausible explanation is that online banking has become a mature and widely adopted service in Malaysia. Basic functionalities such as balance enquiries, fund transfers, bill payments, and transaction history are now considered standard features rather than distinctive benefits. Consequently, customers may perceive usefulness as a minimum service expectation instead of a factor that enhances satisfaction. In other words, usefulness may influence customers' initial adoption of online banking but becomes less important once regular usage has been established. Instead, customers increasingly evaluate their banking experiences based on convenience, simplicity, reliability, and security.

The findings contribute to the existing literature by extending the application of the Technology Acceptance Model within the Malaysian online banking context. While TAM traditionally emphasizes perceived usefulness and perceived ease of use as the primary determinants of technology acceptance, the present study demonstrates that the relative importance of these constructs may change as technologies become more established. The results suggest that perceived ease of use continues to play a dominant role in shaping user satisfaction, whereas perceived usefulness may become less influential in mature digital environments. Furthermore, incorporating perceived security into the research model strengthens the explanatory capability of TAM in online banking settings, where customers' confidence in protecting financial information represents an essential aspect of service evaluation.

From a practical perspective, the findings provide several implications for financial institutions. First, banks should prioritize user-centered interface design by ensuring that online banking platforms remain intuitive, responsive, and easy to navigate across different devices. Continuous usability testing, simplified transaction workflows, and accessible design features can further enhance customers' digital experiences. Second, financial institutions should continue strengthening cybersecurity measures through advanced authentication technologies, real-time fraud detection systems, encryption protocols, and proactive customer education programs. Communicating these security initiatives transparently may also reinforce customers' confidence and satisfaction. Finally, while expanding digital banking functionalities remains important, banks should recognize that introducing additional features alone may not necessarily improve customer satisfaction. Instead, greater emphasis should be placed on improving the quality, reliability, and overall user experience of existing services.

Despite its contributions, this study has several limitations that provide opportunities for future research. First, the study focused exclusively on customers of three commercial banks in Penang, which may limit the generalizability of the findings to other geographical regions or banking institutions in Malaysia. Second, the cross-sectional research design captured respondents' perceptions at a single point in time and therefore could not examine changes in customer satisfaction over time. Third, the study investigated only three dimensions of information technology perceptions. Future research may extend the model by incorporating additional variables such as perceived service quality, digital trust, perceived risk, customer experience, artificial intelligence adoption, or customer engagement to provide a more comprehensive understanding of user satisfaction in digital banking. Longitudinal and comparative studies involving Islamic banks, digital-only banks, and conventional financial institutions would also provide valuable insights into evolving customer expectations within Malaysia's rapidly changing financial landscape.

Overall, the findings demonstrate that user satisfaction with online banking is influenced primarily by customers' perceptions of system usability and security rather than by perceived usefulness. As digital banking services continue to evolve, financial institutions should shift their strategic focus from merely expanding technological functionality towards creating seamless, secure, and customer-centered digital experiences. By doing so, banks will be better positioned to strengthen customer satisfaction, enhance long-term loyalty, and sustain competitive advantage in the increasingly digital financial services industry.

CONCLUSION

The rapid expansion of digital banking has transformed the way customers interact with financial institutions, making user satisfaction an important indicator of the effectiveness of online banking services. Guided by the Technology Acceptance Model (TAM), this study examined the influence of perceived ease of use, perceived usefulness, and perceived security on user satisfaction among online banking users in Penang, Malaysia.

The findings indicate that respondents generally reported a high level of satisfaction with online banking services, suggesting that Malaysian banks have successfully established reliable and accessible digital banking platforms. More importantly, the study demonstrates that perceived ease of use and perceived security significantly influence user satisfaction, whereas perceived usefulness does not have a statistically significant effect. Among the three information technology perception constructs, perceived ease of use emerged as the strongest predictor of user satisfaction, highlighting the importance of intuitive system design and effortless user interaction. These findings suggest that, within a mature online banking environment, customers evaluate their experiences primarily based on usability and security rather than the functional benefits of the technology itself.

From a theoretical perspective, this study contributes to the growing body of literature on digital banking by extending the application of the Technology Acceptance Model in the Malaysian banking context. Although TAM traditionally identifies perceived usefulness and perceived ease of use as key determinants of technology acceptance, the present findings indicate that their relative influence may differ depending on the maturity of the technology. Specifically, the insignificant effect of perceived usefulness suggests that customers increasingly regard core online banking functionalities as standard service expectations rather than value-adding features. Furthermore, the inclusion of perceived security enhances the explanatory capability of TAM in online banking by recognizing the critical role of cybersecurity and data protection in shaping customers' evaluations of digital financial services.

The findings also provide practical implications for banking practitioners. Financial institutions should continue investing in user-centered interface design by simplifying transaction processes, improving navigation, and ensuring consistent performance across digital platforms. Equal attention should be given to strengthening cybersecurity through multi-factor authentication, encryption technologies, fraud detection systems, and continuous customer awareness programs. While expanding digital banking features remains important, banks should recognize that sustainable customer satisfaction is more likely to be achieved through delivering secure, reliable, and effortless digital experiences than by simply increasing the number of available functions.

Despite its contributions, this study has several limitations. The research focused exclusively on customers of three commercial banks located in Penang, which may limit the generalizability of the findings to other banking institutions or geographical regions. In addition, the cross-sectional design captured respondents' perceptions at a single point in time and therefore could not examine changes in customer satisfaction as digital banking technologies evolve. Future studies are encouraged to employ longitudinal research designs, include a broader range of banking institutions such as Islamic and digital-only banks, and investigate additional factors including digital service quality, perceived risk, artificial intelligence adoption, customer experience, and customer engagement. Such investigations would provide a more comprehensive understanding of customer satisfaction in the rapidly evolving digital banking landscape.

In conclusion, this study demonstrates that customer satisfaction in online banking is influenced more strongly by the quality of users' digital experiences than by the functional capabilities of the technology alone. As digital banking continues to evolve, financial institutions should place greater emphasis on designing banking platforms that are intuitive, secure, and responsive to customers' changing expectations. By prioritizing usability and security, banks can strengthen customer satisfaction, enhance long-term loyalty, and sustain competitive advantage within an increasingly digital and customer-centric financial services industry.

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